PhysicsByAaryan

CSIR NET . GATE . JEST . BARC - Physics

Magetostatics - CSIR NET Physics PYQs

Electromagnetism . All PYQs (2015-2025) with answer key

21 questions . Answer key included

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Q1. [Dec 2015] . 5.0 marks
Electromagnetism > Magetostatics

CSIR NET	2015 Dec	5 M

A small magnetic needle is kept at $(0,0)$ with its moment along the x-axis. Another small magnetic needle is at the point $(1,1)$ and is free to rotate in the xy - plane. In equilibrium the angle θ between their magnetic moments is such that

1. $tan\,\theta = \frac{1}{3}$
2. $tan\,\theta = 0$
3. $tan\,\theta = 3$
4. $\tan\theta = 1$

Q2. [June 2015] . 3.5 marks
Electromagnetism > Magetostatics

CSIR NET	2015 June	3.5 M

A proton moves with a speed of $300\ \mathrm{m}/s$ in a circular orbit in the xy-plane in a magnetic field 1 tesla along the positive z direction. When an electric field of $1\ \mathrm{V}/\mathrm{m}$ is applied along the positive y-direction. the centre of the circular orbit

1. remains stationary
2. moves at $1\ \mathrm{m}/s$ along the negative x direction
3. moves at $1\ \mathrm{m}/s$ along the positive z direction
4. moves at $1\ \mathrm{m}/s$ along the positive x direction

Q3. [June 2016] . 5.0 marks
Electromagnetism > Magetostatics

CSIR NET	2016 June	5M

A loop of radius a, carrying a current I, is placed in a uniform magnetic field $\boldsymbol{B}$. If the normal to the loop is denoted by $\hat{n}$, the force $\boldsymbol{F}$ and the torque $\boldsymbol{T}$ on the loop are

1. $\boldsymbol{F} = 0$ and $\boldsymbol{T} = \pi a^2 I \hat{n} \times \boldsymbol{B}$

2. $\boldsymbol{F} = \frac{\mu_0}{4\pi} \boldsymbol{I} \times \boldsymbol{B}$ and $\boldsymbol{T} = 0$

3. $\boldsymbol{F} = \frac{\mu_0}{4\pi} \boldsymbol{I} \times \boldsymbol{B}$ and $\boldsymbol{T} = I \hat{n} \times \boldsymbol{B}$

4. $\boldsymbol{F} = 0$ and $\boldsymbol{T} = \frac{1}{\mu_0 \varepsilon_0} I\boldsymbol{B}$

Q4. [June 2017] . 3.5 marks

Electromagnetism > Magetostatics

CSIR NET	2017 June	3.5M

A set of N concentric circular loops of wire, each carrying a steady current I in the same direction, is arranged in a plane. The radius of the first loop is $r_1 = a$ and the radius of the n^{th} loop is given by $r_n = n r_{n-1}$. The magnitude B of the magnetic field at the centre of the circles in the limit $N \to \infty$, is

1. $\mu_0 I(e^2 - 1)/4\pi a$
2. $\mu_0 I(e - 1)/\pi a$
3. $I(e^2 - 1)/8a$
4. $\mu_0 I(e - 1)/2a$

Q5. [June 2017] . 5.0 marks

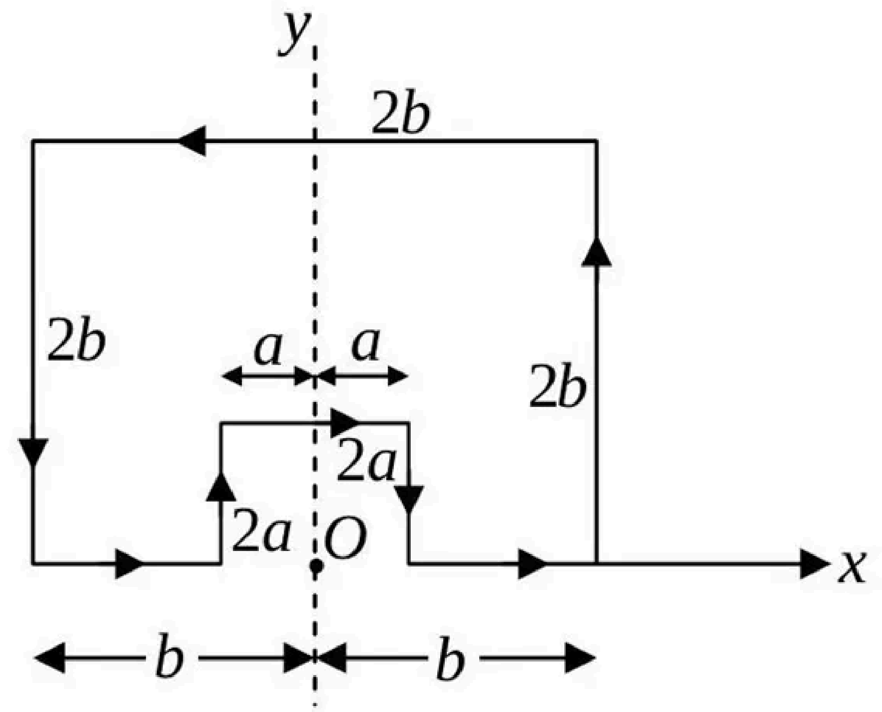
Electromagnetism > Magetostatics

CSIR NET	2017 June	5M

A constant current I is flowing in a piece of wire that is bent into a loop as shown in the figure.

The magnitude of the magnetic field at the point O is

1. $\frac{\mu_0 I}{4\pi\sqrt{5}} ln\left(\frac{a}{b}\right)$
2. $\frac{\mu_0 I}{4\pi\sqrt{5}}\left(\frac{1}{a}-\frac{1}{b}\right)$
3. $\frac{\mu_0 I}{4\pi\sqrt{5}}\left(\frac{1}{a}\right)$
4. $\frac{\mu_0 I}{4\pi\sqrt{5}}\left(\frac{1}{b}\right)$

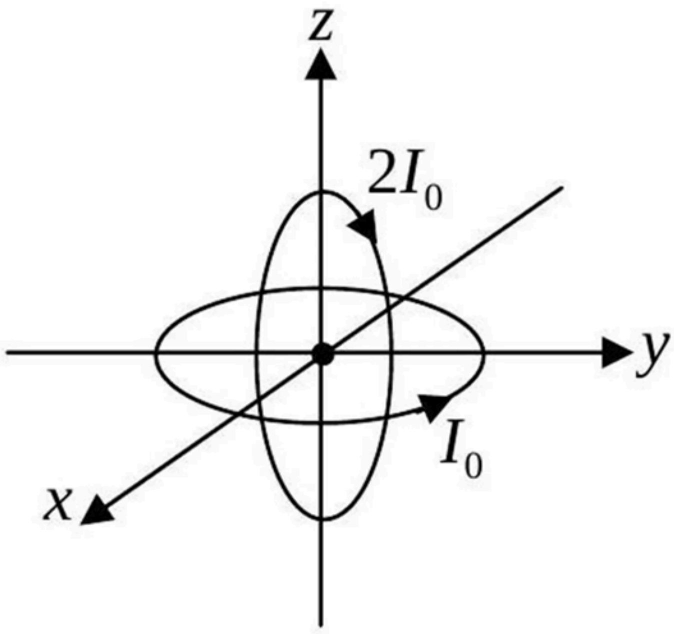


Q6. [Dec 2018] . 3.5 marks

Electromagnetism > Magetostatics

CSIR NET	2018 Dec	3.5M

Two current-carrying circular loops, each of radius R, are placed perpendicular to each other, as shown in the figure. The loop in the xy-plane carries a current I_0 while that in the xz-plane carries a current $2I_0$. The resulting magnetic field $\vec{B}$ at the origin is



1. $\frac{\mu_0 l_0}{2R}[2\hat{j} + \hat{k}]$
2. $\frac{\mu_0 l_0}{2R}[2\hat{j} - \hat{k}]$
3. $\frac{\mu_0 l_0}{2R}[-2\hat{j} + \hat{k}]$
4. $\frac{\mu_0 l_0}{2R}[-2\hat{j} - \hat{k}]$

Q7. [Dec 2018] . 5.0 marks

Electromagnetism > Magetostatics

CSIR NET	2018 Dec	5M

A rotating spherical shell of uniform surface charge and mass density has total mass M and charge Q. If its angular momentum is L and magnetic moment is μ, then the ratio $\frac{\mu}{L}$ is

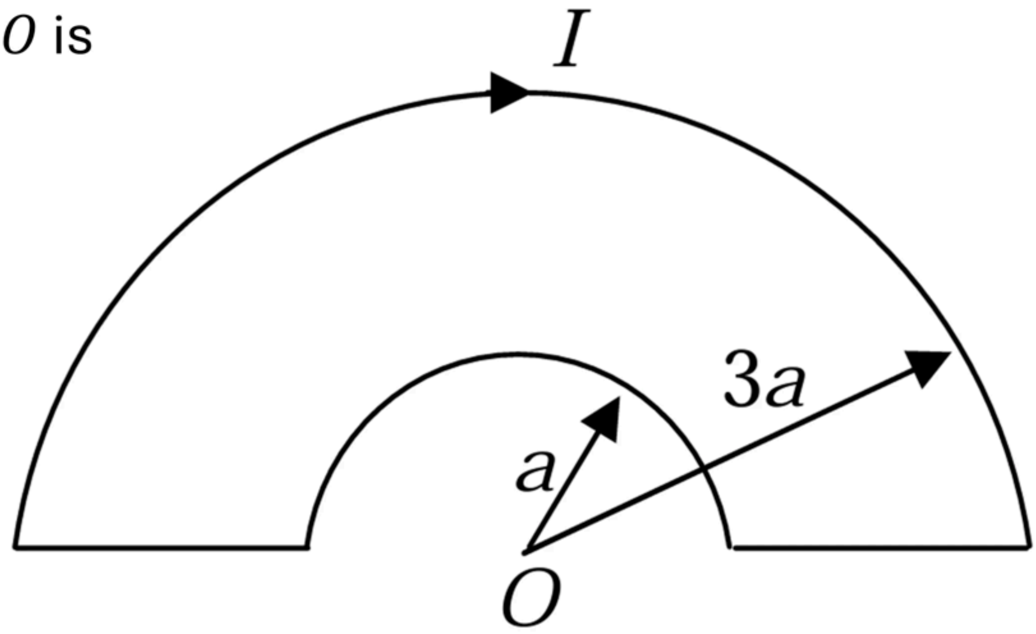
1. $\frac{Q}{3M}$
2. $\frac{2Q}{3M}$
3. $\frac{Q}{2M}$
4. $\frac{3Q}{4M}$

Q8. [June 2018] . 5.0 marks

Electromagnetism > Magetostatics

CSIR NET	2018 June	5M

The loop shown in the figure below carries a steady current I. The magnitude of the magnetic field at the point O is



1. $\frac{\mu_0 I}{2a}$
2. $\frac{\mu_0 I}{6a}$
3. $\frac{\mu_0 I}{4a}$
4. $\frac{\mu_0 I}{3a}$

Q9. [Dec 2019] . 3.5 marks

Electromagnetism > Magetostatics

CSIR NET	2019 Dec	3.5M

A positively charged particle is placed at the origin (with zero initial velocity) in the presence of a constant electric and a constant magnetic field along the positive z and x-directions, respectively. At large times, the overall motion of the particle is adrift along the

1. positive y-direction
2. negative z-direction
3. positive z-direction
4. negative y-direction

Q10. [June 2019] . 3.5 marks
Electromagnetism > Magetostatics

CSIR NET	2019 June	3.5M

Consider a planar wire loop as an n-sided regular polygon, in which R is the distance from the centre to a vertex. If a steady current I flows through the wire, the magnitude of the magnetic field at the centre of the Loop is

1. $\frac{\mu_0 I}{2R}\sin\left(\frac{2\pi}{n}\right)$
2. $\frac{\mu_0 n I}{4\pi R}\sin\left(\frac{\pi}{n}\right)$
3. $\frac{\mu_0 n I}{2\pi R}\tan\left(\frac{2\pi}{n}\right)$
4. $\frac{\mu_0 n I}{2\pi R}\tan\left(\frac{\pi}{n}\right)$

Q11. [June 2020] . 3.5 marks

Electromagnetism > Magetostatics

CSIR NET	2020 June	3.5M

Three infinitely long wires, each carrying equal current are placed in the xy - plane along $x = 0, +d$ and $-d$. On the xy-plane, the magnetic field vanishes at

1. $x = \pm\frac{d}{2}$
2. $x = \pm d\left(1 + \frac{1}{\sqrt{3}}\right)$
3. $x = \pm d\left(1 - \frac{1}{\sqrt{3}}\right)$
4. $x = \pm\frac{d}{\sqrt{3}}$

Q12. [June 2021] . 3.5 marks

Electromagnetism > Magetostatics

CSIR NET	2021 June	3.5M

The vector potential for an almost point like magnetic dipole located at the origin is $\vec{A} = \frac{\mu \sin\theta}{4\pi r^2}\hat{\phi}$ where (r, θ, ϕ) denote the spherical polar coordinates and $\hat{\phi}$ is the unit vector along $\hat{\phi}$. A particle of mass m and charge q, moving in the equatorial plane of the dipole, starts at time $= t = 0$ with an initial speed v_0 and an impact parameter b. Its instantaneous speed at the point of closest approach is

1. v_0
2. $0/0$
3. $v_0 + \frac{\mu q}{4\pi m b^2}$
4. $\sqrt{v_0^2 + \left(\frac{\mu q}{4\pi m b^2}\right)^2}$

Q13. [June 2021] . 3.5 marks

Electromagnetism > Magetostatics

CSIR NET	2021 June	3.5M

In an experiment to measure the charge to mass ratio e/m of the electron by Thomson's method, the values of the deflecting electric field and the accelerating potential are 6×10^6 N/C (newton per coulomb) and 150 V, respectively. The magnitude of the magnetic field that leads to zero deflection of the electron beam is closest to

1. 0.6 T
2. 1.2 T
3. 0.4 T
4. 0.8 T

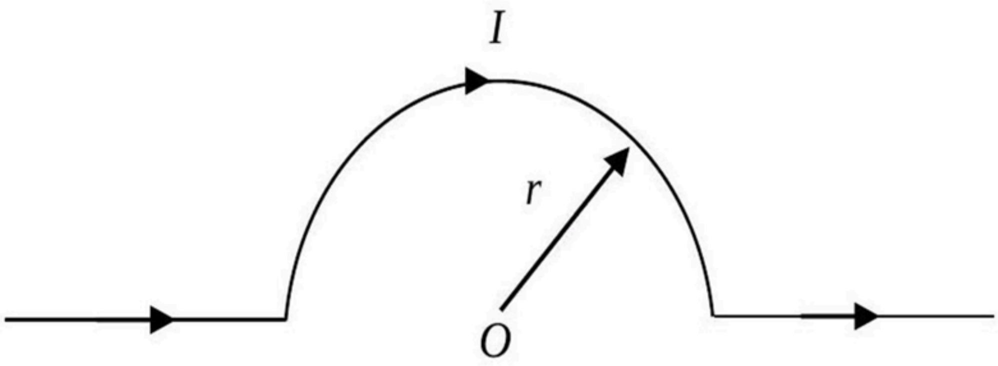
Q14. [June 2022] . 3.5 marks

Electromagnetism > Magetostatics

CSIR NET	2022 June	3.5M

A part of an infinitely long wire, carrying a current I, is bent in a semi-circular arc of radius r (as shown in the figure). The magnetic field at the centre O of the arc is

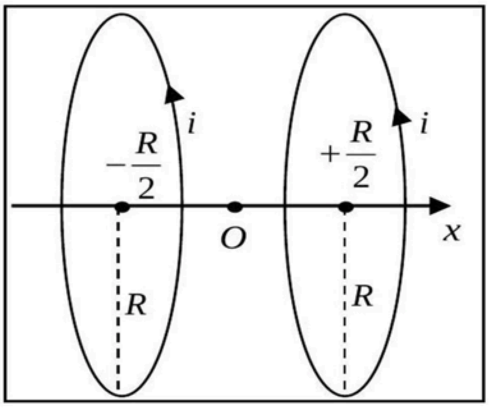
1. $\frac{\mu_0 I}{4r}$
2. $\frac{\mu_0 I}{4\pi r}$
3. $\frac{\mu_0 I}{2r}$
4. $\frac{\mu_0 I}{2\pi r}$



Q15. [June 2022] . 5.0 marks
Electromagnetism > Magetostatics

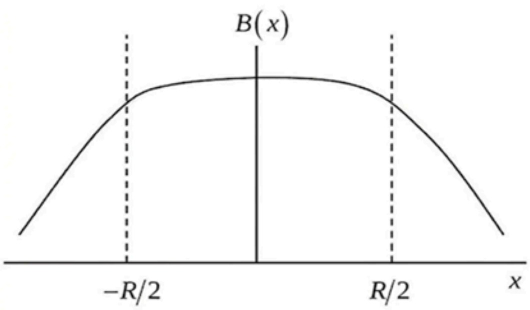
CSIR NET	2022 June	5M

Two parallel conducting rings, both of radius R, are separated by a distance R. The planes of the rings are perpendicular to the line joining their centres, which is taken to be the x-axis.

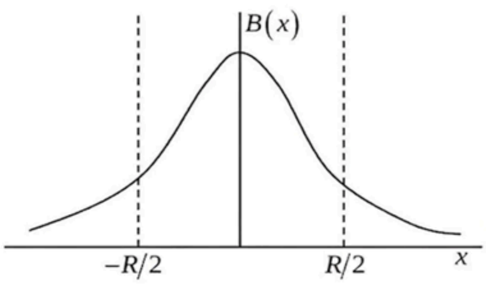


If both the rings carry the same current i along the same direction, the magnitude of the magnetic field along the x-axis is best represented by

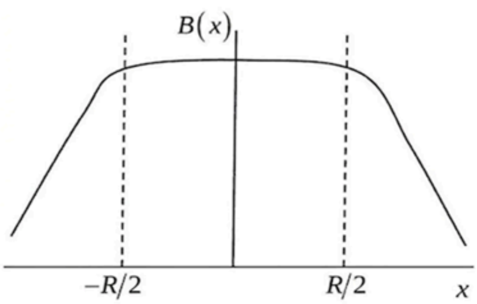
1.



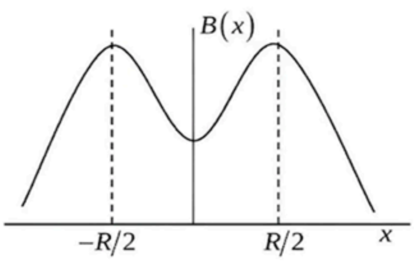
2.



3.



4.



Q16. [Dec 2023] . 3.5 marks

Electromagnetism > Magetostatics

CSIR NET	2023 Dec	3.5 M

A small bar magnet is placed in a magnetic field $B(\vec{r}) = B(x)\hat{z}$. The magnet is initially at rest with its magnetic moment along $\hat{y}$. At later times, it will undergo

1. angular motion in the yz plane and translational motion along $\hat{y}$
2. angular motion in the yz plane and translational motion along $\hat{x}$
3. angular motion in the zx plane and translational motion along $\hat{z}$
4. angular motion in the xy plane and translational motion along $\hat{z}$

Q17. [Dec 2024] . 3.5 marks

Electromagnetism > Magetostatics

CSIR NET	2024 Dec	3.5M

A sphere with uniform charge and mass density, having total charge Q and mass M, rotates about an axis through its center with angular velocity ω. The ratio of its magnetic dipole moment to its angular momentum is

1. $\frac{2Q}{M}$
2. $\frac{Q}{M}$
3. $\frac{Q}{2M}$
4. $\frac{Q}{4M}$

Q18. [Dec 2024] . 5.0 marks

Electromagnetism > Magetostatics

CSIR NET	2024 Dec	5M

An electron enters a region of uniform electric and magnetic fields $\vec{E}_0$ and $\vec{B}_0$. Its velocity, $\vec{E}_0$ and $\vec{B}_0$ are mutually perpendicular to each other. Initially, E_0 is so adjusted that the electron suffers no deflection. E_0 is then switched off and the electron moves in a circular path of radius R. The speed of the electron and its charge to mass ratio would be

1. $\frac{2E_0}{B_0}, \frac{E_0}{2B_0^2R}$
2. $\frac{2E_0}{B_0}, \frac{E_0}{B_0^2R}$
3. $\frac{E_0}{B_0}, \frac{E_0}{B_0^2R}$
4. $\frac{E_0}{B_0}, \frac{2E_0}{B_0^2R}$

Q19. [June 2024] . 5.0 marks

Electromagnetism > Magetostatics

CSIR NET	2024 June	5M

A particle of unit mass and unit charge is moving in a magnetic field, which varies as $\vec{B}(\vec{r}) = b_0\vec{r}/r^3$ (b_0 is a constant) over a region far away from the origin. If $\vec{L}$ is the instantaneous angular momentum of the particle within that region, then $d\vec{L}/dt$ is

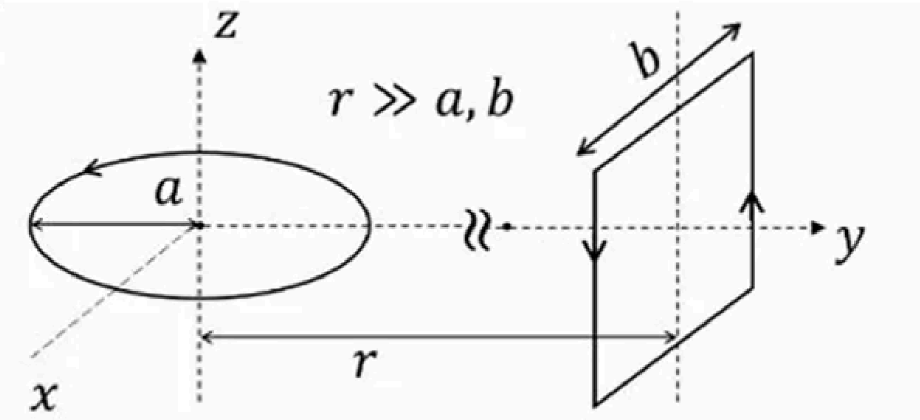
1. $2b_0 \frac{d}{dt}\left(\frac{\vec{r}}{r}\right)$
2. $-b_0 \frac{d}{dt}\left(\frac{\vec{r}}{r}\right)$
3. $b_0 \frac{d}{dt}\left(\frac{\vec{r}}{r}\right)$
4. 0

Q20. [June 2025] . 3.5 marks
Electromagnetism > Magetostatics

CSIR NET	2025 June	3.5M	EMT

A circular loop of radius a (in the $x-y$ plane) and a square loop of side b (in the x-z plane) are kept at a distance r. Both carry current I as shown in the figure. If $r \gg a, b$, the torque exerted on the square loop by the circular loop is

1. $-\frac{\mu_0}{4\pi}\frac{1}{r^3}\pi a^2 b^2 I^2 \hat{z}$
2. 0
3. $\frac{\mu_0}{4\pi}\frac{1}{r^3}\pi a^2 b^2 I^2 \hat{x}$
4. $-\frac{\mu_0}{4\pi}\frac{1}{r^3}\pi a^2 b^2 I^2 \hat{x}$

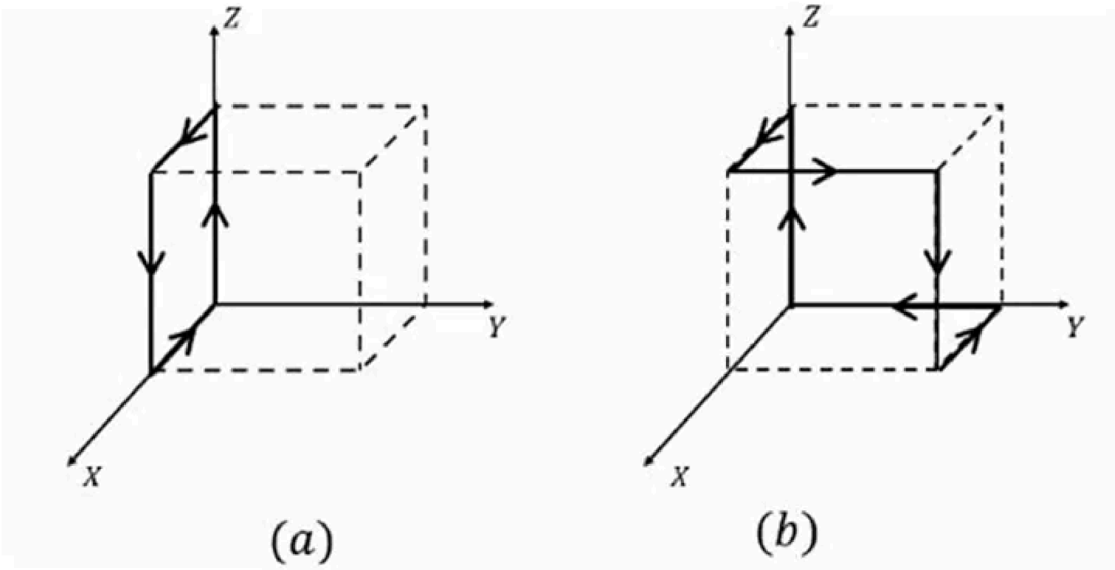


Q21. [June 2025] . 5.0 marks
Electromagnetism > Magetostatics

CSIR NET	2025 June	5M	EMT

Two identical cubes are shown in figures (a) and (b). The magnitude of the magnetic field at the centre of the cube in (a), produced by the currents as shown, is B_o. The magnitude of the magnetic field at the centre of the cube in (b) will be

1. $\sqrt{3}B_o$
2. $2B_o$
3. $\frac{3}{2}B_o$
4. $\sqrt{2}B_o$



Answer Key

21 questions . Subject and topic for quick revision

Q. No	Subject	Topic	Answer
Q1	Electromagnetism	Magetostatics	**3**
Q2	Electromagnetism	Magetostatics	**4**
Q3	Electromagnetism	Magetostatics	**1**
Q4	Electromagnetism	Magetostatics	**4**
Q5	Electromagnetism	Magetostatics	**2**
Q6	Electromagnetism	Magetostatics	**3**
Q7	Electromagnetism	Magetostatics	**3**
Q8	Electromagnetism	Magetostatics	**2**
Q9	Electromagnetism	Magetostatics	**1**
Q10	Electromagnetism	Magetostatics	**4**
Q11	Electromagnetism	Magetostatics	**4**
Q12	Electromagnetism	Magetostatics	**1**
Q13	Electromagnetism	Magetostatics	**4**
Q14	Electromagnetism	Magetostatics	**1**
Q15	Electromagnetism	Magetostatics	**1**
Q16	Electromagnetism	Magetostatics	**2**
Q17	Electromagnetism	Magetostatics	**3**
Q18	Electromagnetism	Magetostatics	**3**
Q19	Electromagnetism	Magetostatics	**3**
Q20	Electromagnetism	Magetostatics	**4**
Q21	Electromagnetism	Magetostatics	**1**

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